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Issued May 6, 1912.

U. S. DEPARTMENT OF AGRICULTURE.

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FARMERS' BULLETIN 497.

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Rev.ed.  
follows

SOME COMMON GAME, AQUATIC,  
AND RAPACIOUS BIRDS IN  
RELATION TO MAN.

BY

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WASHINGTON:  
GOVERNMENT PRINTING OFFICE.

1912.

## LETTER OF TRANSMITTAL.

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UNITED STATES DEPARTMENT OF AGRICULTURE,  
BUREAU OF BIOLOGICAL SURVEY,  
*Washington, D. C., March 18, 1912.*

SIR: I have the honor to transmit herewith and to recommend for publication as a Farmers' Bulletin a report on Some Common Game, Aquatic, and Rapacious Birds in Relation to Man, by W. L. McAtee and F. E. L. Beal, assistants in the Biological Survey. Careful study of the food habits of the game birds, including the group known as shore birds, shows that these birds are of great value to the farmer. The water birds, as the grebes, gulls, and terns, have greater economic value and do less harm than is ordinarily supposed, while some species, like Franklin's gull and the black tern, are markedly beneficial. It is pointed out in this bulletin that many birds of prey are exceedingly valuable to the farmer, but the opposite is true of the Cooper's hawk, the sharp-shinned hawk, and the goshawk, which should be destroyed as the determined foes of poultry, game birds, and most of the smaller insectivorous species.

Respectfully,

HENRY W. HENSHAW,  
*Chief, Biological Survey.*

HON. JAMES WILSON,  
*Secretary of Agriculture.*

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# SOME COMMON GAME, AQUATIC, AND RAPACIOUS BIRDS IN RELATION TO MAN.

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## INTRODUCTION.

Game and aquatic birds, as a rule, have less economic interest than the species more closely associated with man. Nevertheless nearly all aquatic birds have important relations with the fishing industry. One of the birds, the horned grebe, sometimes accused of living entirely upon fish, is here shown to feed largely on crawfish, other crustaceans, and insects. Terns also have been held responsible for the serious reduction of food fishes in some localities, but a careful study of their food habits demonstrates that only a small proportion of their diet consists of such fishes. On account of the relatively small number of terns it is manifestly impossible for them to do all the damage attributed to them even if they fed exclusively on food fishes. Certain aquatic birds approach the land birds in feeding habits; examples are Franklin's gull and the black tern, both of which by their destruction of insects are beneficial to man. All the shore birds are strikingly beneficial in their food habits, and the slaughter of these game birds deprives the farmer of valuable allies against some of the worst crop pests. The food habits of the upland plover and killdeer are here described as illustrating the beneficial qualities of the group. The gallinaceous game birds, as quail, grouse, and pheasants, take far less insect food than the shore birds, yet all of them do a certain amount of good. Because of their close contact with crops it is important that their economic relations be made widely known.

The hawks and owls have a bad name, but for the most part it is undeserved, and indiscriminate persecution of these birds is a serious mistake. Accounts of six species are given in this bulletin in order to point out the distinction between injurious hawks and owls and useful ones. The latter should be carefully protected.

## PRAIRIE CHICKEN.

(*Tympanuchus americanus*.)

The prairie chicken (fig. 1), now common only in Kansas, Nebraska, Minnesota, the Dakotas, and Manitoba, is one of the birds which formerly occurred over a much wider range than at present and in

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NOTE.—A list giving the titles of all Farmers' Bulletins available for distribution will be sent free upon application to a Member of Congress or the Secretary of Agriculture.

far greater abundance. It has been reduced principally by hunters, as have so many of our finest species of birds. Many sportsmen declare allegiance to the highest principles of game preservation yet fail to practice these principles. Our present game laws, even though efficiently administered, will save no species of birds, as the



FIG. 1.—Prairie chicken.

its family the prairie chicken is very prolific, and if adequately protected would soon become numerous in its old haunts. The bird is easily domesticated, hence is eminently suited for propagation on preserves. As the increase of game in this manner is the only way to preserve it indefinitely and at the same time allow hunting, the plan

rapid growth of the army of sportsmen and pot hunters more than counterbalances the effect of the shortening of open seasons and reduction of bag limits. Moreover, game laws, as a general rule, are not strictly obeyed. In southern Wisconsin, where there was a closed season on prairie chickens for a term of years, to the writers' knowledge these birds were killed at every opportunity. The customary excuse was: "They are so scarce they won't breed up again anyway." Aside from showing culpable willingness to assist in the birds' extermination, this remark is untrue. Like all birds of

should be actively put into operation by those most interested in the preservation of game—the sportsmen.

The prairie chicken is valuable not only as game, but as an efficient destroyer of farm pests, and any farmer would profit by having these birds reared on his place. Almost 15 per cent of the bird's food consists of weed seeds, including those of such pests as foxtail grass, smartweeds, and ragweed. More than 10 per cent of the diet consists of rose hips. A few other fruits are eaten and more than a fourth of the food consists of leaves, flowers, and shoots, collectively known as browse. The prairie chicken eats a great deal of grain, but takes most of it from stubble. The bird is fond of such mast as hazelnuts and acorns.

Nearly 15 per cent of the bird's food consists of insects, the bulk of them being grasshoppers. Almost every kind of grasshopper, locust, or cricket appears to be acceptable, and nearly 20 different kinds were identified from the stomachs. The prairie chicken made itself especially useful during the destructive invasions of the Rocky Mountain locust. Sixteen birds examined at that time were found to have eaten 866 locusts. Among other pests eaten by this species are the Colorado potato beetle, 12-spotted cucumber beetle, sugar-beet leaf-beetle, May beetles, cotton worm, army worm, cutworms, the yellow bear caterpillar, and chinch bug.—W. L. M.

### CALIFORNIA QUAIL.

(*Lophortyx californica*.)

The California quail (fig. 2) is common and generally distributed over the States west of the Sierra, except at the higher altitudes, and is especially abundant in the fruit-raising sections. Like the bob-white of the East, this quail never goes far from cover, and it delights to dwell on unimproved land where trees and chaparral alternate with small areas of open ground. In settled regions it is somewhat domestic in habits and soon becomes accustomed to living in orchards, gardens, and cultivated grounds. The writer has seen a female sitting upon her eggs in a garden within 30 feet of a house, between which and the nest carriages and foot passengers passed many times each day. In winter a covey frequently feeds with the farmer's chickens, and if not disturbed will continue to do so until pairing time.

The natural food of the quail consists of the seeds of the vast number of plants known as weeds, with a little foliage of the same, especially in winter, when the leaves are young and tender. Considering how small is the amount of fruit usually found in the stomach of this bird, it is a surprise to learn that it sometimes does serious damage to vineyards. Investigation, however, shows that, as in most other similar cases, the injury results only when too many birds gather



in a limited area. Nearly all the complaints against the quail for eating fruit are that it visits vineyards in immense numbers and eats grapes. When thousands visit a vineyard, even if only occasionally, and each bird eats or spoils at least one grape, the result is disastrous.

An observer states that he once saw a flock of about 1,000 quail



FIG. 2.—California quail.

eating Zinfandel grapes in a vineyard\* in the central part of the State, and another says that in southern California he has seen as many as 5,000 feeding upon Muscat grapes. In the writer's interviews with California fruit growers, only one mentioned the quail as harmful. His ranch was situated along the hills on the side of a narrow valley, adjacent to wild grazing land with much chaparral and forest, among which the quail lived. In this case the annual loss was estimated at 2 or 3 tons of grapes.

In the laboratory investigation of the food of the California quail 619 stomachs were examined. They were collected in every month except May, but only

one was obtained in March. The other months are well represented. Animal food, principally insects, amounts to but 3 per cent, and most of this was found in the stomachs of young birds, mere broodlings. Vegetable food amounts to 97 per cent and consists mainly

of seeds of plants most of which are of noxious or troublesome species.

*Animal food.*—Ants appear to be a favorite food. They were found in 82 stomachs, and were eaten by adults as well as by young. They amount, however, to less than 1 per cent of the whole diet. The rest of the animal food aggregates a little more than 2 per cent and is distributed as follows: Beetles in 30 stomachs, bugs (Hemiptera) in 38, caterpillars in 11, grasshoppers in 7, flies in 2, spiders in 6, millepedes in 1, and snails in 2. The most interesting point in this connection was the stomach of a broodling only 3 or 4 days old. Besides several adult Hemiptera, some ants, caterpillars, and spiders, and a few seeds, it contained 280 minute insects, which constituted 76 per cent of the stomach's contents, and were identified as an immature form of species of scale, *Phenacoccus helianthi*.

In this connection the following extract from a letter dated at Los Angeles, Cal., October 28, 1908, by Dr. W. G. Chambers to the Secretary of Agriculture, is interesting:

Last May during the hatching season one of my female quail died a week prior to completing the hatch. An incandescent light of 8 candlepower was substituted, the result being 15 baby quail, very wild at first, not understanding human sounds or language, but finally becoming as docile as pet chickens. They were raised in my back yard, running at large after the first week.

A number of Marguerite bushes which grow in profusion in the yard were so infested with black scale that I had decided to uproot them and had postponed doing so as the little quail worked so persistently among the branches; upon investigation I discovered them eating the scale and twittering happily; they would swallow the fully developed scale and thoroughly clean the branches of all those undeveloped.

The young in the first week of life eat animal matter to the extent of from 50 to 75 per cent of the food, but by the time they are 4 weeks old they take little if any more animal food than the adults.

*Vegetable food.*—The vegetable part of the quail's food may be divided into fruit, grain, seeds, and forage. Fruit appeared in 106 stomachs and aggregates 2.3 per cent of the yearly diet. It was distributed as follows: Grapes in 7 stomachs, prunes in 9, apples in 3, rubus (blackberry or raspberry) in 4, olive in 1, elderberry in 21, snowberry in 8, Manzanita in 2, huckleberry in 11, and rose haws in 3. Pulp and skins, identified as fruit only, were found in 27 stomachs, and unknown seeds, probably those of some small fruit or berry, occurred in 10 stomachs. It is evident that the percentage of any one of the above is insignificant. Stomach examination throws no new light upon the quail's grape-eating habits, except to show that the ravages complained of are exceptional. That fruit does not constitute any important part of the bird's annual food is clearly proved.

Grain was found in 133 stomachs and constitutes 6.4 per cent of the food. It was distributed as follows: Corn in 14 stomachs, wheat in 15, oats in 13, barley in 89, and rye in 2. The principal complaints against the quail on the score of grain eating are that flocks sometimes visit newly sown fields and eat large quantities of the seed. Walter E. Bryant says on this point:

Two males which I shot one evening as they were going to roost for the night after having been feeding on a newly sown field contained the following, mainly in the crop: (a) Two hundred and ten whole grains of barley, 6 pieces of broken barley, 3 grains of "cheat," and 1 of wheat, besides a few barley hulls, some clover leaves, and alfilaria; (b) 185 whole grains of barley, 5 broken pieces, 4 grains of "cheat," and 2 of wheat; also barley hulls, clover, and alfilaria. The flock numbered nearly or quite 20 birds.<sup>1</sup>

Only one report accuses the bird of eating grain from the harvest field. Mr. W. T. Craig, of San Francisco, writing to the United States Department of Agriculture, says:

I have observed the quail enter a field of wheat to the number of thousands, and had they not been driven away they would have destroyed the whole crop.

Stomach examination does not indicate any month in which grain is eaten in excess of other food. January shows the highest percentage, 12.4, but November is nearly as high, while December, although between the two, shows less than 3 per cent. A little more than 3 per cent was eaten in February, and none at all in March and April, though the newly sown grain would be accessible in one at least of these months. June and July, the harvest months, show, respectively, 4.1 per cent and 10.7 per cent. In fact the stomach record plainly indicates that the quail does not make special search for grain, but being naturally a seed eater takes grain when it comes in the way.

The seeds of a multitude of plants which have no apparent useful function except to increase by their decay the deposit of humus in the soil constitute the staff of life of the quail. In this particular investigation they aggregate 62.5 per cent of the food of the year. They appear in stomachs taken in every month and reach a good percentage in each, the only months that show much diminution in quantity being January, February, March, and April, when new forage partly replaces seeds. The percentage is highest in June, 85.9, but shows no great falling off from July to December, inclusive. Seventy-three kinds of seeds were identified, at least generically, and more than half of them were determined specifically. Many more were ground up so as to be unrecognizable.

Bur thistle, lupines, bur clover, and turkey mullein appear to be the favorite seeds; that the others are not distasteful is shown by the quantities found in some stomachs. For instance, mayweed was identified in only 27 stomachs, yet one stomach contained at least 2,000 of these seeds; pigweed (*Chenopodium*) in but 11, yet 1 con-

<sup>1</sup> Zee, IV, pp. 55-56, 1893-94.

tained 1,000. One stomach held 83 kernels of barley, 592 seeds of geranium, 560 of tarweed, 40 of bur thistle, 48 of clover, 80 of alfilaria, 704 of timothy, 32 of catchfly, and 5 of snowberry, or 2,144 seeds in all. Another contained 1,696 geranium seeds, 14 bur thistle, 24 knotweed, 14 tarweed, 38 bur-clover, 148 alfilaria, 12 ray grass, and 1 unknown seed, and a pod of uncertain origin—in all, 1,947 seeds and a pod. In both cases the contents of the crop is included with that of the stomach or gizzard. These samples indicate considerable variety in the quail's diet, even in one meal.

Grass and other forage constitute a little over 25 per cent of the quail's annual food. Forage amounts to less than 1 per cent in June, remains about the same until October, and increases somewhat in November. In January it becomes important, and it reaches nearly 60 per cent of the food for the next four months. The maximum, 85 per cent, occurs in March; but this percentage, based on only one stomach, can not be considered final. Seeds and forage are practically complementary to each other; that is, as one increases the other decreases. June, which shows the least forage, has the largest percentage of seeds. Leaves of red and of bur clover and of alfilaria were the favorite kinds, and in some cases constituted the whole stomach contents. Blades of grass are frequently taken. A few bits of acorn, and perhaps other nuts, were eaten, but the quantity is insignificant.

*Summary.*—From the above analysis of the food of the California quail it is apparent that under normal conditions the farmer and fruit grower have nothing to fear from its ravages. When, however, large areas of chaparral land are cleared and brought under cultivation, it is natural that the products of garden and vineyard should be eaten to a greater or less extent by quail, which abound in such localities. On the other hand, its seed-eating record is in its favor. Usually there is little difficulty in getting rid of a superfluity of game birds; in fact, in most cases the trouble is to prevent their extermination. This is strikingly illustrated by the fact that, in order to restock its depleted covers, an attempt is now being made in southern California to import quail from the peninsula of Lower California. A bird so large, so easily trapped, so valuable for food, and withal one whose pursuit affords such excellent sport as the valley quail, will rarely become numerous enough to do serious damage, and then only locally and under unusual conditions. When such conditions arise, a reduction of numbers is the easiest and simplest cure. Permits to trap quail on one's own premises are obtainable in California on application to the State fish commissioner. After the birds have been sufficiently reduced they can be kept within reasonable limits by a moderate amount of shooting in the proper season.—F. E. L. B.

## RUFFED GROUSE.

*(Bonasa umbellus.)*

The ruffed grouse (fig. 3), called "partridge" in the northeastern States and pheasant in some other parts of its range, is one of our most widely ranging game birds. It inhabits wooded regions from



FIG. 3.—Ruffed grouse.

Canada and Alaska south to California, Colorado, Tennessee, and northern Georgia. It is usually a wild and wary bird and well withstands the attacks of hunters, but it responds to protection in a gratifying manner and has proved to be well adapted to propagation under artificial conditions. On account of these qualities and its desirability as a game species it is a good subject for game farming.

Wild fruits, mast, and browse make up the bulk of the vegetable food of this species. It is very fond of hazelnuts, beechnuts, chestnuts, and acorns and it eats practically all kinds of wild berries and other fruits. Nearly 60 kinds of

fruits have been identified from the stomach contents examined. Various weed seeds are also consumed.

Slightly more than 10 per cent of the food consists of insects, about half of which are beetles. The most important pests devoured are the Colorado potato beetle, clover-root weevil, the pale-striped flea

beetle, grapevine leaf-beetle, May beetles, grasshoppers, cotton worms, army worms, cutworms, the red-humped apple caterpillar, and sawfly larvæ.—W. L. M.

### INTRODUCED PHEASANTS.

(*Phasianus torquatus* and *P. colchicus*.)

While introduced pheasants may hardly seem to deserve a place on a list of common birds, the extent to which they are being imported and propagated in the United States makes it desirable that information be made available as to their feeding habits when liberated. Ringneck pheasants (fig. 4) have long been established in Oregon, Washington, and British Columbia, and are less common in the wild state in Massachusetts, New York, Indiana, and Kansas. But persistent efforts, in some cases on a very large scale, are being made to establish pheasants in other States, and the farmers whose land they are likely to range over should have access to information concerning their economic value.

Severe criticism of pheasants and fulsome praise are about equal in volume. The birds are accused of digging newly planted and sprouting corn, oats, barley, and beans, and seeds of melons, cucumbers, and squashes. It is claimed that



FIG. 4.—Ringneck pheasant.

because of their depredations it has been necessary to replant whole fields of corn. They are said to drive chickens away from their food and even to kill young poultry. Some landowners in Ontario County, N. Y., claim that the loss suffered on account of pheasants has been more than twice the amount of their taxes.

On the other hand the birds have not proved a nuisance in Oregon and Washington, where they have been numerous for years. Some farmers even value them so highly that they will not permit hunting on their property.

The few pheasant stomachs examined indicate that these birds are very fond of grain. Oats and wheat compose about 34 per cent of the food of 12 ringneck pheasants collected in Oregon and Washington, and 82.5 per cent of the stomach contents of two English pheasants from British Columbia. But all of these birds were taken in September, October, and December; hence it is probable that all of this grain was waste. The next largest item of food in these stomachs was insects, consisting entirely of larvæ of March flies (*Bibio*). One stomach contained no fewer than 360 of these larvæ and another 432. The remainder of the food included acorns, pine seeds, browse, peas, rose hips, snowberries, and seeds of dandelion, lupine, bur clover, black mustard, and chickweed.

From 200 to 960 kernels of wheat and oats were taken by various birds; about 200 peas were found in one stomach, but it was evident that these were the old and partly decomposed refuse of the harvest. Twenty-three acorns and 200 pine seeds were taken by the bird which ate the largest amount of mast, and about 800 capsules of chickweed, containing more than 8,000 seeds, were in the stomach of the best weed-seed eater.

What is most evident is that pheasants are gross feeders; their capabilities for good or harm are great. If a number of them attack a crop they are likely to make short work of it, or if they devote themselves to weed seeds or insect pests they do a great deal of good. It seems therefore that the question of the economic value of pheasants is peculiarly a local one. Much depends on the proportion of land under cultivation, the kind of crops raised, and the quantity of wild food available. Apparently the chances are about even that imported pheasants will or will not become useful economic factors.—W. L. M.

### UPLAND PLOVER.

(*Bartramia longicauda*.)

The upland plover (fig. 5) forms a striking exception in habits to its closest relatives, the sandpipers. While sandpipers love the vicinity of water, the upland plover frequents dry hills and prairies

and is most abundant in the interior. This so-called plover breeds from Oregon, Oklahoma, and Virginia north to Alaska, Mackenzie, and Maine, and migrates over the more southern parts of the continent, passing to the pampas of Argentina to spend the winters.

From its habits the upland plover would naturally be expected to have a closer relation to agriculture than most sandpipers, and such proves to be the case. Almost half its food is made up of

grasshoppers, crickets, and weevils, all of which exact heavy toll from cultivated crops.

Among the weevils eaten are the cottonboll weevil; greater and lesser clover-leaf weevils; clover-root weevil;

*Epicærus imbricatus*, which is known to attack almost all garden and orchard crops; cowpea curculios; *Tanymecus confertus*, an enemy of sugar beets; *Thecesternus humeralis*, which has been known to injure grapevines; and bill bugs. *Theces-*

*ternus* alone composes 3.65 per cent of the seasonal food of the 163 stomachs examined, and bill bugs constitute

5.83 per cent. No fewer than 8 species of bill bugs were identified from the stomachs. These weevils injure, often seriously, such crops as corn, wheat, barley, and rye, as well as forage plants of many kinds.

The upland plover further makes itself useful to the farmer by devouring leaf-beetles, including the grapevine colaspis, southern corn leaf-beetle, and other injurious species; wireworms and their adult forms, the click beetles; white grubs and their parents, the May



FIG. 5.—Upland plover.



beetles; cutworms, army worms; cotton worms; cotton cutworms, sawfly larvæ; and leatherjackets or crane-fly larvæ. They befriend cattle by eating horseflies and their larvæ, and cattle ticks.

They eat a variety of other animal forms, such as moths, ants, and other Hymenoptera, flies, bugs, centipeds and millepedes, spiders, snails, and earthworms. Practically 97 per cent of the food consists of animal matter, chiefly of injurious and neutral forms. The vegetable food comprises the seeds of such weed pests as buttonweed, foxtail grass, and sand spurs, and hence is also to the credit of the bird.

Notwithstanding that the upland plover injures no crop and consumes a host of the worst enemies of agriculture, it is one of the numerous shore birds that have been hunted to the verge of extinction. Can it be that the American public will allow one of the best friends of agriculture to be exterminated by hunters who care only for the momentary excitement of dropping these swiftly flying birds and the pleasure of devouring the few mouthfuls of savory flesh they afford?—W. L. M.

### KILLDEER.

(*Oxyechus vociferus*.)

The killdeer (fig. 6) is one of the best known American birds. It frequents cultivated lands and even roads and the vicinity of buildings. It is well named "vociferus," for it delights in repeating the loud and penetrating call of "kill-dee, kill-dee," from which its common name is taken. The killdeer nests throughout the United States and southern Canada. Some individuals spend the winter in the southern half of the United States or occasionally even farther north, while others go as far south as northern South America.

Like the upland plover the killdeer spends much of its time away from water. It frequently nests in cornfields or pastures and, as noted above, even comes about the abode of man. These preferences naturally influence the food habits of the species, affording it an opportunity to destroy insects which are directly related to agriculture. The food of the killdeer is varied, being composed of the following principal items: Beetles, 37.06 per cent; other insects, as grasshoppers, caterpillars, ants, bugs, caddis flies, dragon flies, and two-winged flies, 39.54 per cent; and other invertebrates, as centipeds, spiders, ticks, oyster worms, earthworms, snails, crabs, and other crustacea, 21.12 per cent. Vegetable matter composes 2.28 per cent of the total food, and is chiefly made up of weed seeds, such as buttonweed, smartweed, foxtail grass, and nightshade.

Among the injurious beetles consumed are the following weevils: Alfalfa weevil, cotton-boll weevil, clover-root weevil, clover-leaf

weevil, rice weevil, cowpea curculio, white-pine weevil, and bill bugs. The latter alone constitute more than 2 per cent of the whole food. The alfalfa weevil, a new and destructive pest, is relished by the killdeer, 41 being found in a single stomach. Other destructive beetles devoured are white grubs and their adult forms, the May beetles; wireworms and their imago, the click beetles; larvæ of the genus *Ligyris*, which attack sugar cane, corn, and carrots; brown-fruit beetles, which injure apples and corn; the grapevine leaf-beetle; southern corn-leaf beetle; two-striped tortoise beetle, which injures sweet potatoes; and a flea beetle which attacks tobacco and sugar beets.

Cicadas, buffalo tree hoppers, and negro bugs, the last named injuring parsley and raspberries, are some of the true bugs relished by the killdeer. Caterpillars are a favorite article of diet, and several very injurious species are eaten, as the cotton worm, cotton cutworm, other cutworms, and caterpillars of the genus *Phlegethon-*  
*tius*, which damage



FIG. 6.—Killdeer.

tomatoes and tobacco. Grasshoppers and crickets, including mole crickets, are a staple food. Two-winged flies or Diptera furnish 11.91 per cent of the food of the killdeer. Such pests as crane flies and their larvæ, known as leatherjackets, are eaten, as well as horse-flies and mosquitoes and their larvæ. One stomach contained hundreds of larvæ of the salt marsh mosquito (*Aedes sollicitans*), which is one of the most troublesome of the biting species. The State of

New Jersey has spent thousands of dollars in trying to reduce the numbers of this pest. The killdeer thus befriends man, but it does something also for the domestic animals, not only by eating horseflies and mosquitoes, as just mentioned, but also by preying upon ticks, including the American fever or cattle tick, which has caused such enormous losses in some parts of the South.

Crawfish, well-known pests in levees, and even in corn, cotton, and other fields in certain localities, are another item of the killdeer's food, and 3.62 per cent of the subsistence of the 228 birds examined was composed of worms of the genus *Nereis*, which prey upon oysters.

In all, 97.72 per cent of the killdeer's food is composed of insects and other animal matter. The bird preys upon many of the worst crop pests and is a valuable economic factor. There can be no logical reason for continuing to regard it as a game bird.—W. L. M.

### HORNED GREBE.

(*Colymbus auritus*.)

Grebes are among the most interesting of water birds. Their power of diving as quick as a flash or of sinking beneath the surface without leaving a ripple has earned for them such names as hell-diver, sprite, and water witch. Grebes are not only accomplished divers, but swim well under water for long distances—not exclusively by aid of the feet, however, as is often stated. The writer has more than once seen the pied-bill grebe using its wings in underwater progression. Grebes have difficulty in rising from the water, but fly well when under way. When alighting they strike the water with a splash, gliding some distance on the breast. The nests are built of water-soaked vegetation, a portion of which is used to cover the eggs in the absence of the parents.

To illustrate the food habits of grebes, the horned grebe (fig. 7) is chosen. This species has a circumpolar range. In North America it breeds from the northern tier of the United States northward, and winters from the southern boundary of the breeding range south to Florida and California. The most remarkable point about the food habits of grebes is that the stomachs almost invariably contain a considerable mass of feathers. Feathers are fed to the young, and there is no question that they play some essential though unknown part in the digestive economy. As they are finely ground in the gizzards it is probable that finally they are digested and the available nutriment assimilated. Feathers constituted practically 66 per cent of the contents of the 57 horned grebe stomachs examined. However, it is not likely that they furnish a very large percentage of the nourishment needed by the birds. As the nutritive value of the feathers is unknown, this part of the stomach contents is ignored.

The other items of food are assigned 100 per cent, and the percentages are given on that basis. Various beetles, chiefly aquatic, compose 23.3 per cent of the food; other insects (including aquatic bugs, caddis and chironomid larvæ, dragon-fly nymphs, etc.), nearly 12 per cent; fishes, 27.8 per cent; crawfish, 20.7 per cent; and other crustacea, 13.8 per cent. A little other animal matter is taken, including snails and spiders, and a small quantity of vegetable food was found in two stomachs.

It has been claimed that grebes live exclusively on fishes and do mischief in fish hatcheries. The results obtained by stomach examinations show that they do not depend wholly or even chiefly upon



FIG. 7.—Horned grebe.

fish. On the contrary, they eat a large number of crawfishes, which often severely damage crops, and consume numbers of aquatic insects which devour small fishes and the food of such fishes.—W. L. M.

### FRANKLIN'S GULL.

(*Larus franklini*.)

The term "gull" usually suggests a vision of dashing spray or far-extending beaches with reedy bays and outreaching points of sand or islets on which the birds rest to preen their feathers after their long flights, and where perchance they make their nests and rear their young. The species under consideration (fig. 8), however, spends little time on the seacoast but is an inhabitant of far-inland prairies and broad reaches of marsh land, where it lives and breeds during the warm season. In winter it retires southward, but lingers long enough in some of the Southern States to be of material

assistance to agriculture. Its center of abundance in North America during the breeding season is west of the Mississippi River and north of Iowa, east of the Rocky Mountains, but it is known to breed to some extent both south and east of these limits. The marshy lakes of this region afford ideal nesting sites for the species, while the adjoining broad stretches of prairie land yield an abundance of their favorite food. A few decades ago these birds occupied this vast region undisturbed, but to-day the plow is turning up the sod and the mower cutting the grass of the boundless fields over which for centuries they have foraged. With the advent of agricultural operations some changes harmful to the birds must necessarily take place, but it behooves the tillers of the soil to leave the gulls unmolested as far as possible, for where they abound they are a most potent

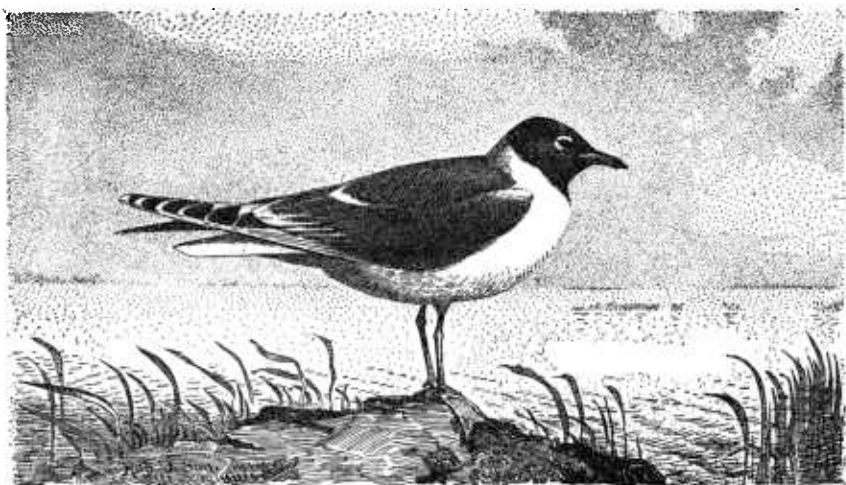


FIG. 8.—Franklin's gull.

factor in the reduction of insect life. They do not by any means confine themselves to marshes when seeking for food, but fly over the dry prairie and even visit cultivated fields, looking for grubs, grasshoppers, and other insects. When unmolested they become quite fearless and follow the plowman to gather the grubs and worms from the newly turned furrows.

In an investigation of the food of Franklin's gull 93 stomachs were examined. Nearly all were taken from their breeding grounds and in the breeding season. Unfortunately none were secured during July, which is probably the very height of the reproductive period.

Of the whole food 94.46 per cent consisted of animal matter and 5.54 per cent of vegetable. Of the latter nearly all was of no significance, probably being taken accidentally, except the contents of

2 stomachs collected in May in North Dakota. About 75 per cent of the contents of each of these consisted of wheat probably gathered from newly sown fields. This was the only vegetable food found in any stomach that was of the least economic value.

Of the animal food the most important item is grasshoppers. These amount to 43.43 per cent of the food of the season, and in September and October constitute over four-fifths of the whole diet. As an example of the number these birds can eat at a single meal, the following may be cited. Stomach A contained 70 entire grasshoppers and jaws of 56 more, with remains of 3 crickets. Stomach B contained 20 beetles, 66 crickets, 34 grasshoppers, and 3 other insects. Stomach C contained 90 whole grasshoppers, the jaws of 52 more, with 8 crickets, 1 bug, and 1 caterpillar. Stomach D contained 82 beetles, 87 bugs, 984 ants, 1 cricket, 1 grasshopper, and 2 spiders, or 1,157 insects in all. Stomach E was filled with 327 nymphs of dragon flies. Several other stomachs were completely filled with grasshoppers and crickets, too far advanced in digestion to be counted. Adults and larvæ (grubs) of May beetles were also a large component of the food and these were probably taken upon cultivated ground. Stomachs collected in Louisiana during the fall migration contained in addition to grasshoppers and beetles large numbers of true bugs (Hemiptera), including several species which are injurious to cotton, tobacco, and squashes. From this brief statement of the food of Franklin's gull, farmers will readily perceive that these birds are very desirable neighbors and will do all in their power to protect them.

There are several other species of gulls and terns that, like Franklin's, take up their residence about the lakes and marshes in the interior of the country. Their food habits, as far as known, are all beneficial to the farmer. They are great eaters of grasshoppers and have been seen catching those insects on the wing and also may often be seen following the plow in search of the grubs and beetles turned up. Among these are the California gull (*Larus californicus*), the ring-billed gull (*Larus delawarensis*), and the black tern (*Hydrochelidon nigra surinamensis*). The latter lives and breeds about marshes where there is often little or no open water.

An illustration of the value of gulls as insect destroyers is furnished by the experience of the Mormons when they settled in Utah and raised their first crops of grain. This is graphically described by Hon. Geo. A. Cannon, temporary chairman of the Third Irrigation Congress:

Black crickets came down by millions and destroyed our grain crops; promising fields of wheat in the morning were in the evening as smooth as a man's hand—devoured by the crickets. At this juncture sea gulls [California gulls] came by hundreds and thousands, and before the crops were entirely destroyed these gulls devoured the

insects, so that our fields were entirely freed from them. The settlers at Salt Lake regarded the advent of the birds as a heaven-sent miracle. \* \* \* I have been along the ditches in the morning and have seen lumps of these crickets vomited up by these gulls, so that they could again begin killing.

These "lumps of crickets" were undoubtedly "pellets" of the indigestible parts habitually disgorged by the birds. At the time of the Nevada mouse plague in Humboldt Valley in 1907, gulls, as well as hawks and owls, were noted feasting on the destructive rodents.—F. E. L. B.

### TERNS.

Like the gulls, terns are usually associated in the mind with the seacoast, but at least six species breed in the interior of the continent. The terns are expert in flight, and so trim and graceful in appearance that they have received the name sea swallows. They breed in colonies, usually nesting on low islands. This leads to the destruction of large numbers of eggs and young by high tides. Formerly terns were slaughtered for millinery purposes to such an extent that some species have been almost extirpated.

Persons engaged in the plumage business have made the not disinterested charge that terns devour large numbers of food fishes and hence should be destroyed. In order to ascertain the truth of the matter the Biological Survey has made a thorough examination of the question. Too few stomachs of the caspian, roseate, and arctic terns have been examined to form a basis for satisfactory conclusions, but a fair number of stomachs of five other species were available—the royal tern, Forster's tern, common tern, least tern, and black tern.

**Royal tern** (*Sterna maxima*).—Twenty-four stomachs were examined. They contained 3 per cent of crustacea and 97 per cent of fish. The fishes were yellow perch (*Perca flavescens*), 4 per cent, taken in North Carolina in July; bluefish (*Pomatomus saltatrix*), 8 per cent, taken in Florida in March; menhaden (*Brevoortia tyrannus*), 65 per cent, taken in Georgia in November and December, Alabama in October, and Florida in February, August, October, November, and December; and unidentified fishes, 20 per cent.

Thus it is probable that not more than 16 per cent of the normal food consists of fishes eaten by man. The feeding upon menhaden, tons of which are made into fertilizer, is insignificant economically.

**Forster's tern** (*Sterna forsteri*).—The food of 34 specimens of this species consisted of crustacea, 2 per cent, and fish, 98 per cent. The largest item of finny food was menhaden (*Brevoortia tyrannus*), 28.2 per cent, found in stomachs taken in South Carolina, Georgia, and Florida in November, December, and January, respectively. Silvery anchovies (*Stolephorus*) (not the anchovies of commerce),

forming 24.1 per cent, were next in rank. They were taken in California in September and December, and in Georgia and Florida in November, December, and January. Fresh-water minnows (*Cyprinidae*) composed 20.5 per cent of the food. Following these in importance were pompanos (*Trachinotus carolinus*), 5.9 per cent; round herrings (*Etrumeus sadina*), 5.8 per cent; mummichogs (*Fundulus zebrinus*) and fresh-water sticklebacks (*Eucalia inconstans*), 2.6 per cent each. Unidentified fish made up 7.3 per cent of the food.

Thus only 5.9 per cent of the food of Forster's tern, as at present known, consists of food fishes; 92 per cent consists of fishes of no direct value to man, among which are sticklebacks, which feed upon the spawn of other fishes.

**Common tern**  
(*Sterna hirundo*).—

One hundred and sixteen stomachs of the common tern (fig. 9) have been examined. One per cent of their food consists of mollusks, crusta-

cea, and the worms (*Nereis*) which feed upon oysters. Two per cent is composed of moths and 1.5 per cent of other insects, including grasshoppers, crickets, ants, dragon flies, caddis flies, beetles, and bugs. The remaining 95.5 per cent consists of fishes. The largest



FIG. 9.—Common tern.



item is fresh-water minnows (*Cyprinidæ*), 23.3 per cent. Sand launces (*Ammodytes americanus*) make 17.8 per cent of the food. Other fishes eaten are menhaden (*Brevoortia tyrannus*), 5.1 per cent; yellow perch (*Perca flavescens*) and sticklebacks (*Gasterosteus bispinosus*), 4.3 per cent each; and silvery anchovies (*Stolephorus*), chub mackerel (*Scomber colias*), and silversides (*Menidia*), 1 per cent each.

Only 6 per cent of the bird's food is composed of food fishes. To offset this, 3.5 per cent consists of insects, mostly injurious, and 4.3 per cent of sticklebacks, of which a distinguished naturalist (Günther) says: "It is scarcely to be conceived what damage these little fishes do, and how greatly detrimental they are to the increase of all the fishes among which they live, for it is with the utmost industry, sagacity, and greediness that they seek out and destroy all the young fry that come their way."

Almost 85 per cent of the food consists of fishes of neutral importance.

**Least tern** (*Sterna antillarum*).—Almost half (43.1 per cent) of the food of 49 least terns consists of silver anchovies (*Stolephorus*). They were captured from New Jersey to Florida and Louisiana in May and June. Menhaden (*Brevoortia tyrannus*) compose 6.8 per cent; mummichogs (*Fundulus*), 6.3 per cent; silversides (*Menidia*), 1.1 per cent; and unidentified fish, 37.7 per cent. The remaining 5 per cent of the food is made up of crustacea. No food fishes were identified from stomachs of the least tern.

**Black tern** (*Hydrochelidon nigra surinamensis*).—The food of the black tern (fig. 10) is more varied than that of any other species. Fish, chiefly minnows (*Cyprinidæ*) and mummichogs (*Fundulus*), compose a little more than 19 per cent of the total contents of 145 stomachs. Dragon flies make more than 20 per cent; May flies, 13 per cent; grasshoppers, 12 per cent; predaceous diving beetles, almost 6 per cent; scarabæid beetles, almost 5 per cent; leaf beetles, 3½ per cent; gnats and other flies, more than 8 per cent; crustacea, 3½ per cent. Other items of food are ground-beetles (*Carabidæ*), click beetles (*Elateridæ*), weevils, stone flies, caddis flies, water striders, moths, and ants.

The bird preys upon no food fishes, as far as known, but does feed extensively upon such fish enemies as dragon-fly nymphs, dytiscid beetles, and crawfishes. It takes a great variety of insects, including some of economic importance, as the moth of the cotton bollworm and the fall army worm, click beetles (adults of wireworms), weevils, and grasshoppers.

*Summary.*—The average percentage of food fishes in the regimen of these five species of terns is only 4.8 per cent. This refutes the charge that they live largely on food fishes. Among the other fishes

eaten, menhaden are prominent, forming an average of 21 per cent of the food. Since these fish are so enormously abundant that their chief economic value is for fertilizer and oil, hundreds of tons of which are made, the number of them consumed by terns is insignificant. Silvery anchovies (*Stolephorus*) and fresh water minnows (Cyprinidæ) compose about 13 per cent each. These little fishes swarm in shallow waters and are of no direct value to man.

The charge that terns prevent the increase of food fishes by eating the small fishes which are their natural food is wholly unfounded, since there is no scarcity in the food supply, but on the contrary a constant superabundance. In this connection we would point out that some largely herbivorous food fishes, such as the buffalo fishes, with whose food supply the terns have very little to do, have alarmingly decreased, just as have some of the carnivorous ones. The cause of reduction in the num-

ber of food fishes is not chiefly failure of the natural food supply, but, as has been pointed out by experts of the United States Bureau of Fisheries, too close fishing.

The responsibility for the scarcity of certain food fishes, therefore, can not justly be placed upon the terns, especially since it is shown that a very small proportion of their diet is composed of these fishes.

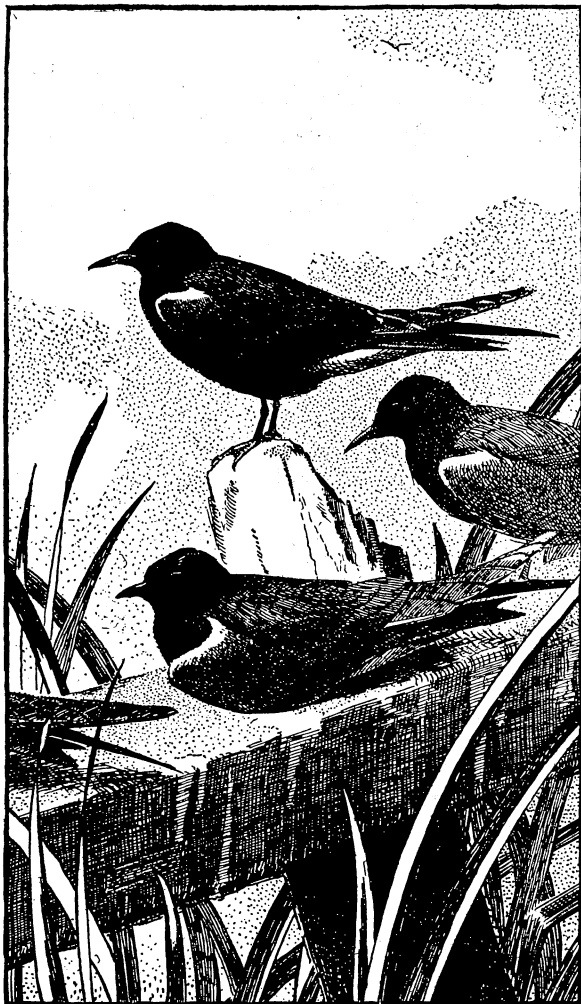


FIG. 10.—Black tern.

Moreover, it must be remembered to their credit that part of their food consists of economically injurious fishes, and that in the case of some species a considerable proportion of insects is taken, most of which are directly injurious to the fishing industry.—W. L. M.

### COOPER'S HAWK.

(*Accipiter cooperi*.)

Cooper's hawk (fig. 11) may be taken as a type of the group of hawks whose habits are responsible for the condemnation of birds of prey as a whole. This group includes three species: Cooper's hawk,



FIG. 11.—Cooper's Hawk.

the sharp-shinned hawk, and the goshawk. They are often spoken of as blue darters, a name which expresses a characteristic difference in their manner of hunting from that of other hawks. They course over the country at great speed and capture their prey by sudden darts. The blue darters are long-tailed hawks, but they should not be confounded with that other conspicuously long-tailed bird, the marsh hawk. The latter usually flies

slowly and may be recognized by the white rump. The red-tailed, red-shouldered, and other large hawks usually watch for their prey from some convenient lookout station or soar slowly over meadow and forest, watching a chance to pounce upon their quarry. These hawks almost always seize their victims on the ground, while hawks of the darter group often take them in full flight. This difference is of course chiefly due to the character of the prey, the darters feeding almost exclusively upon birds, which usually must be caught on the wing, while the other hawks prey upon

mice and other small mammals, snakes, and grasshoppers and other insects, which as a rule must be sought on the ground.

Cooper's hawk, which occurs throughout the United States, is pre-eminently a "chicken hawk," and it is by far the most destructive species we have to contend with, not because it is individually worse than the goshawk, but because it is so much more numerous that the aggregate damage done far exceeds that of all other birds of prey. It is strong enough to carry away a good-sized chicken, grouse, or cottontail rabbit. It is especially fond of domesticated doves and when it finds a cote easy of approach it usually takes a toll of one or two a day. Practically every stomach of Cooper's hawk examined contained remains of wild birds or poultry.—  
W. L. M.

### THE ROUGH-LEGGED HAWK.

(*Archibuteo lagopus sancti-johannis*.)

The rough-legged hawk (fig. 12), whose range, in general terms, is North America north of Mexico, is a representative of the class of almost wholly beneficial hawks. In regard to its habits Dr. Fisher says:

The rough-leg is one of the most nocturnal of our hawks, and may be seen in the fading twilight watching from some low perch, or beating with measured, noiseless flight,



FIG. 12.—Rough-legged hawk.

over its hunting ground. It follows two very different methods in securing its food, one by sitting on some stub or low tree and watching the ground for the appearance of its prey, as the red tail does; the other by beating back and forth just above the tops of the grass or bushes, and dropping upon its victim after the manner of the marsh hawk. Its food consists principally, if not almost exclusively, of the smaller rodents, and most prominent among these are the arvicoline mice and lemmings. As is well known, the meadow mice (*Arvicola*) are widely distributed over the north temperate zone, and often occur in immense numbers, overrunning certain sections of country, and doing irreparable damage to crops as well as to fruit and ornamental trees. Repeatedly young orchards, consisting of hundreds of trees, and representing great

money value, have been totally destroyed by these pests. The damage is done in winter, under the snow, where the mice eat the bark from the trees, often completely girdling them and causing death. Usually meadow mice are fairly common if not abundant over a large part of the meadow and marsh lands of the central and northern United States and temperate Canada. To show how important meadow mice are to the rough leg as an article of food, it may be stated in general terms that the southern limit of its wandering in winter is nearly coincident with the southern boundary of the region inhabited by meadow mice. In the north lemmings are abundant over

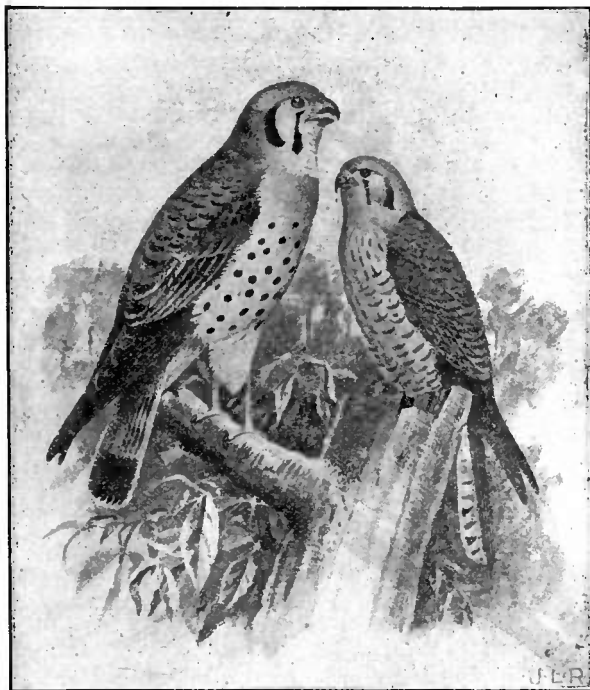


FIG. 13.—Sparrow hawk.

the country in which the rough leg makes its summer home, and furnish a never-failing supply of food for old and young.<sup>1</sup>

Meadow mice were found in 28 stomachs, 5 or 6 occurring in several, and as many as 12 in 1. A few rats, house mice, shrews, and other small mammals also were found, birds appearing in only 3 stomachs.—W. L. M.

### SPARROW HAWK.

(*Falco sparverius*.)

The sparrow hawk (fig. 13) ranges over almost the whole of North America. It is the smallest as well as one of the handsomest of our hawks and one of the best known. It is further distinguished by its

<sup>1</sup> Bull. 3, Biological Survey, p. 87, 1893.

swallowlike flight, its habit of hovering over the luckless grasshopper or meadow mouse it hopes to make a meal of, and its repeated shrill wavering cry. "It is the only one of the true falcons," as has been pointed out by Dr. Fisher, "which can be placed in the mainly beneficial class." He says further:

At times it attacks small birds and young chickens, but these irregularities are so infrequent that they are more than outweighed by its good services in destroying insects and mice. Grasshoppers, crickets, and other insects form its principal food during the warm months, while mice predominate during the rest of the year. Terrestrial caterpillars, beetles, and spiders also are eaten to a considerable extent. As might be expected, a large proportion of the birds captured are taken during the nesting season, the hawks then having less time to secure their favorite food. It is at this time also that they commit depredations in poultry yards. During late fall and winter, meadow mice and house mice form a large part of their food, the former being taken in fields and meadows and the latter around corn stacks and about barns and outbuildings. Because of its confidence and lack of fear the sparrow hawk is one of the species which suffers most from unjust bounty laws. Any vandal who can carry a gun is able to slaughter this little hawk. Mr. W. B. Hall, of Wakeman, Ohio, writes us that while the hawk law was in force in Ohio he was township clerk in his native village and issued 86 certificates, 46 being for sparrow hawks. He examined the stomachs and found 45 of them to contain the remains of grasshoppers and beetles, while the remaining one contained the fur and bones of a meadow mouse.<sup>1</sup>

W. L. M.

### LONG-EARED OWL.

(*Asio wilsonianus*.)

The long-eared owl occurs throughout the United States. It is nocturnal in its habits and is one of our most beneficial species. Mice, principally meadow mice, are its staple food. One hundred and fifty pellets collected by Dr. Fisher under the roost of a bird of this species at Munson Hill, Va., contained remains of 95 meadow mice, 19 pine mice, 15 house mice, 5 white-footed mice, 3 Cooper's mice, 26 shrews, and 13 birds, of which 11 were sparrows, 1 a bluebird, and the other a warbler. Eighty-six out of 92 stomachs examined also contained mice. The bird is common all over the United States and does a great deal of good. It is not wary, hence is one of the greatest sufferers where bounties are paid for the destruction of birds of prey.—W. L. M.

### SCREECH OWL.

(*Otus asio*.)

The little screech owl (fig. 14), in the South aptly called "shivering owl," in allusion to its quavering whistle, or perhaps to the effect of that call upon the listener, ranges from coast to coast and far beyond both the northern and southern boundaries of the United States. With the exception of the burrowing owl it feeds more

<sup>1</sup> Circ. 61, Biological Survey, p. 9, 1907.

extensively on insects than any of the other owls. It is also, according to Dr. Fisher—

a diligent mouser, and feeds more or less on crawfish, frogs, toads, scorpions, lizards, and fish. \* \* \*

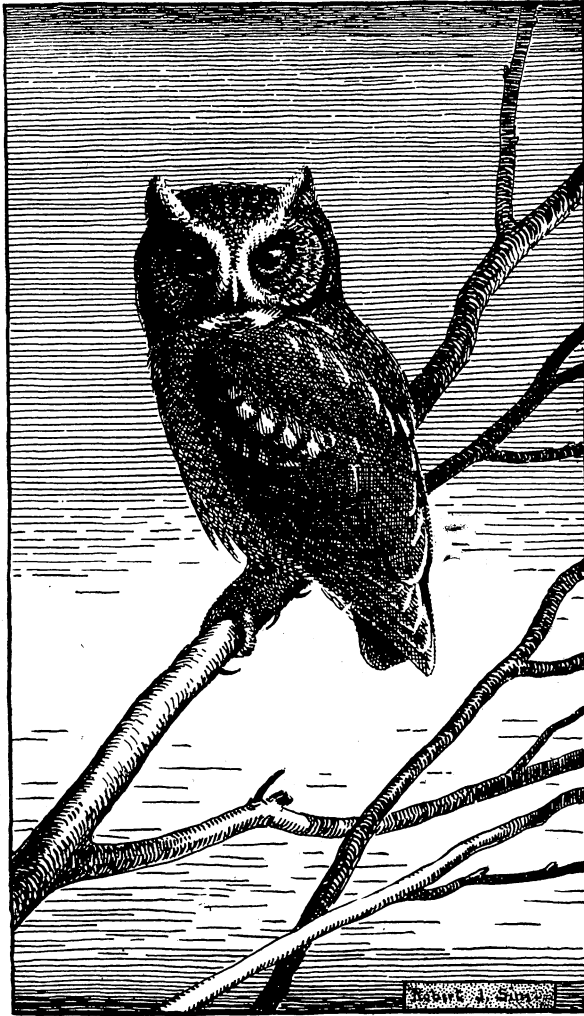


FIG. 14.—Screech owl.

Among insects, grasshoppers, crickets, beetles, and cutworms are most often eaten. As many as 50 grasshoppers have been found in one stomach, 18 May beetles in another, and 13 cutworms in another. During the warmer parts of the year it is exceptional to find a stomach not well filled with insect remains. Meadow mice, white-footed mice, and house mice are the mammals most often taken, while chipmunks, wood rats, flying squirrels, and moles are less frequently found. The screech owl is fond of fish and catches many, especially in winter, when he watches near the breathing holes in the ice, and seizes the luckless fish which comes to the surface. Most of the birds destroyed by this owl are killed either in severe winter weather or during the breeding season, when it has hard work to feed its young. As nearly three-fourths of the owl's food consists of injurious mammals and insects, and only about one-seventh of birds (a large proportion of which are destructive

English sparrows), there is no question that this little owl should be carefully protected.<sup>1</sup>

W. L. M.

<sup>1</sup> Circ. 61, Biological Survey, pp. 12-13, 1907.